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ELEKTROMATEN®

Installation instructions

Door control

TS 970

51171582_c_01.2014

0000000 0000 51171582 XXXXX

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Contents

Symbols

Warning - Risk of injury or danger to life!

Warning - Danger to life from electric shock!

Note - Important information!

▶ **Prompt** - Required action!

Illustrations show example products. Differences from the delivered product are possible.

1 General safety information

Intended use

The door control is intended for a power-operated door with drive unit (NES/DES limit switch system from GfA).

Safe operation is only guaranteed with specified normal use. The drive unit is to be protected from rain, moisture and aggressive ambient conditions. No liability for damage by other applications or non-observance of the instructions.

Modifications are only permitted with the agreement of the manufacturer. Otherwise it will void the manufacturer's declaration.

Safety information

Installation and initial start-up by skilled personnel only.

Only authorised persons are permitted to work on electrical systems. They must assess the work given to them, recognise potential danger zones and be able to take appropriate safety measures.

Only carry out installation work when the supply has been switched off.

Observe the applicable regulations and standards.

Coverings and protective devices

Only operate with appropriate coverings and protective devices.

Ensure that gaskets are fitted correctly and that all cable glands are tightened.

Spare parts

Only use original spare parts.

2 Technical data

Series	TS 970	
Dimensions W x H x D	155 x 386 x 90	mm
Installation	vertical	
Vibration	free of vibration Installation	
Operating frequency	50/60	Hz
Supply voltage (+/- 10%)	1 N~220 V, PE 3 N~220-400 V, PE 3~220-400 V, PE	
Output power for drive unit, maximum	3	kW
Protection per phase, on-site	10-16	A
External supply voltage: (internal electronic protection)	24	V DC
	0.18	A
External supply voltage: X1/L, X1/N (protection via F1 micro-fuse)	1 N~230 V	
	1.6	A time-lag
Control inputs	24	V DC
	type 10	mA
Type of relay contact Max. current of 1A at 230VAC, and 0.4A at 24VDC (The use of LED lamps is recommended.)	potential-free changeover contact	
Loading of relay contacts, ohmic/inductive	230	V AC
	1	A
Control power consumption	10	VA
Temperature range	Operation: -10..+50 Storage: +0..+50	°C
Humidity	to 93 % non-condensing	
Protection class of housing	IP54	
Compatible GfA limit switch	NES; DES	

3 Mechanical installation

Control installation!

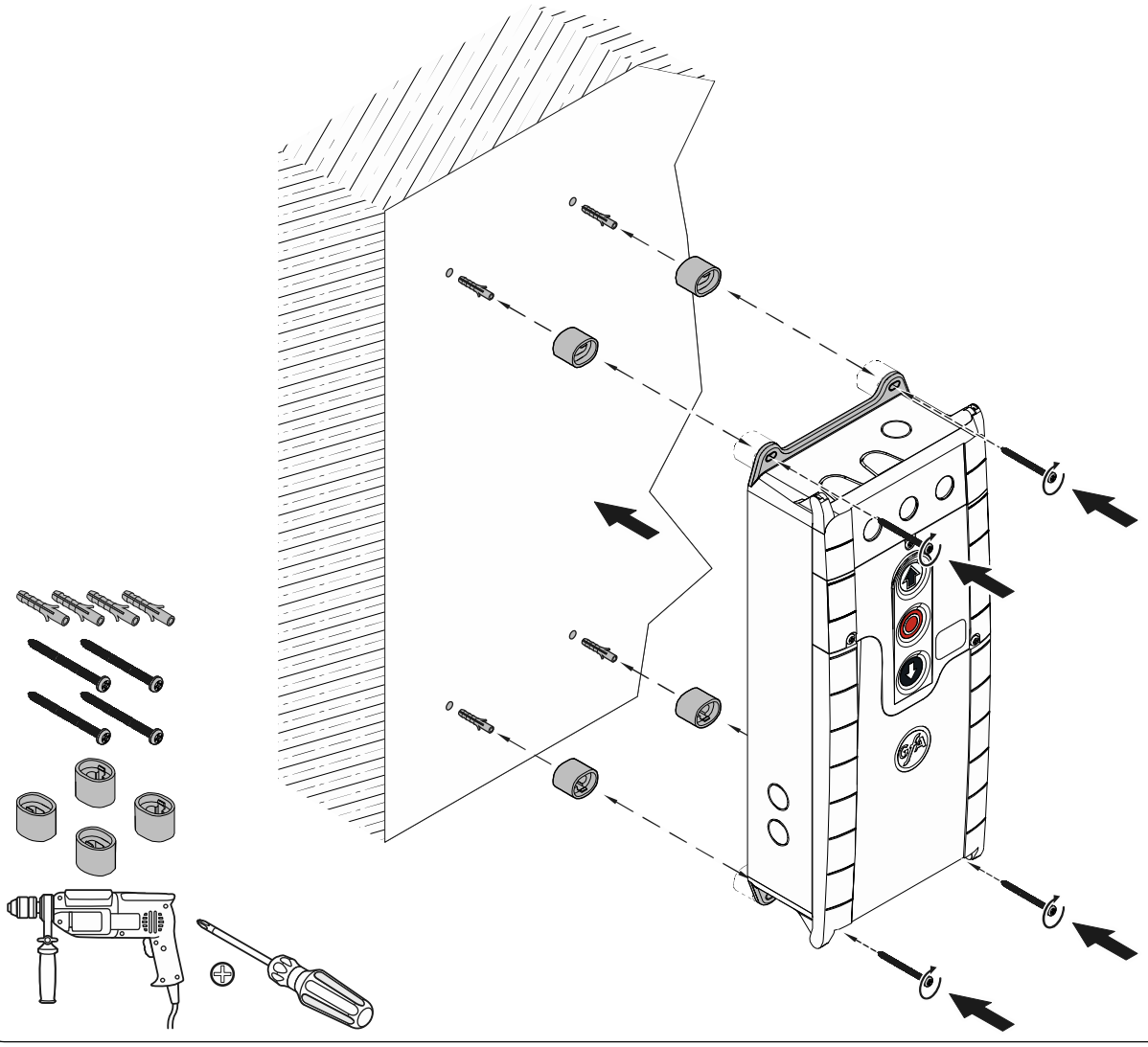
- Indoor use only
- Mount on a level ground free of vibration
- Only mount in the vertical position
- Door must be in clear view from place of assembly

Requirements

The permissible loads on walls, mountings, connection and transmission elements must not be exceeded.

Mounting

The control is mounted via 4 elongated holes



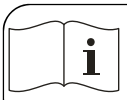
4 Electrical installation

Warning - Danger to life from electric shock!

- Disconnect the cables (mains OFF) and check that the supply is off
- Observe the applicable regulations and standards
- Ensure proper electrical connection
- Use suitable tools

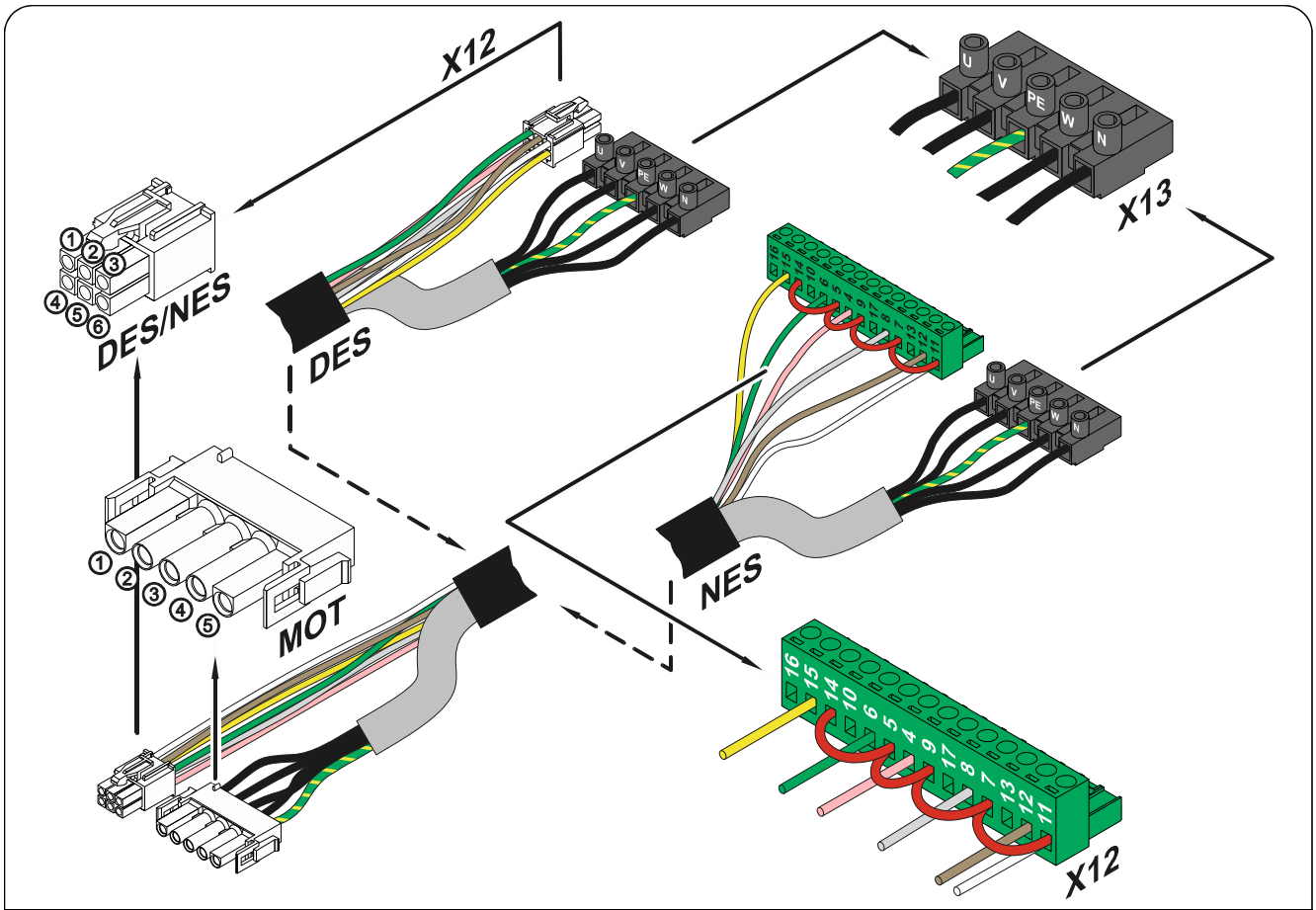
On-site backup fuse and disconnector unit!

- Only use current sensitive earth leakage circuit breakers type B for FI-drive units
- Connection to the indoor installation via an all-pole disconnector unit, with current ≥ 10 A as per EN 12453 (e.g. CEE plug connector, main switch)



Read the drive unit installation instructions!

Connection cable connection overview

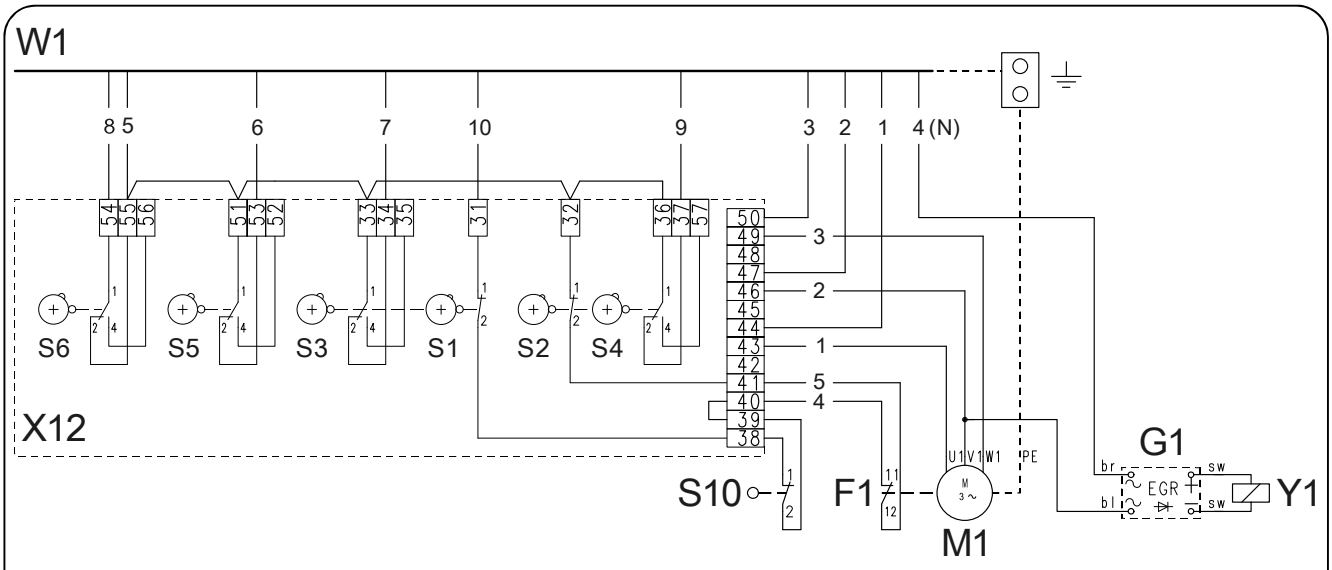


DES and NES Motor connection cable			
MOT		**X13**	Motor plug
Pin	Core	Term.	
1	3	**W**	Phase W
2	2	**V**	Phase V
3	1	**U**	Phase U
4	4	**N**	Neutral conductor (N)
5	PE	**PE**	

DES Connection cable limit switch			
DES		**X12**	Limit switch plug
Pin	Core	Term.	
1	5/wh	**1**	+24 V safety circuit
2	6/bn	**2**	Channel B (RS485)
3	7/gn	**3**	Ground
4	8/ye	**4**	Channel A (RS485)
5	9/gy	**5**	Safety circuit
6	10/pk	**6**	8 V DC supply voltage

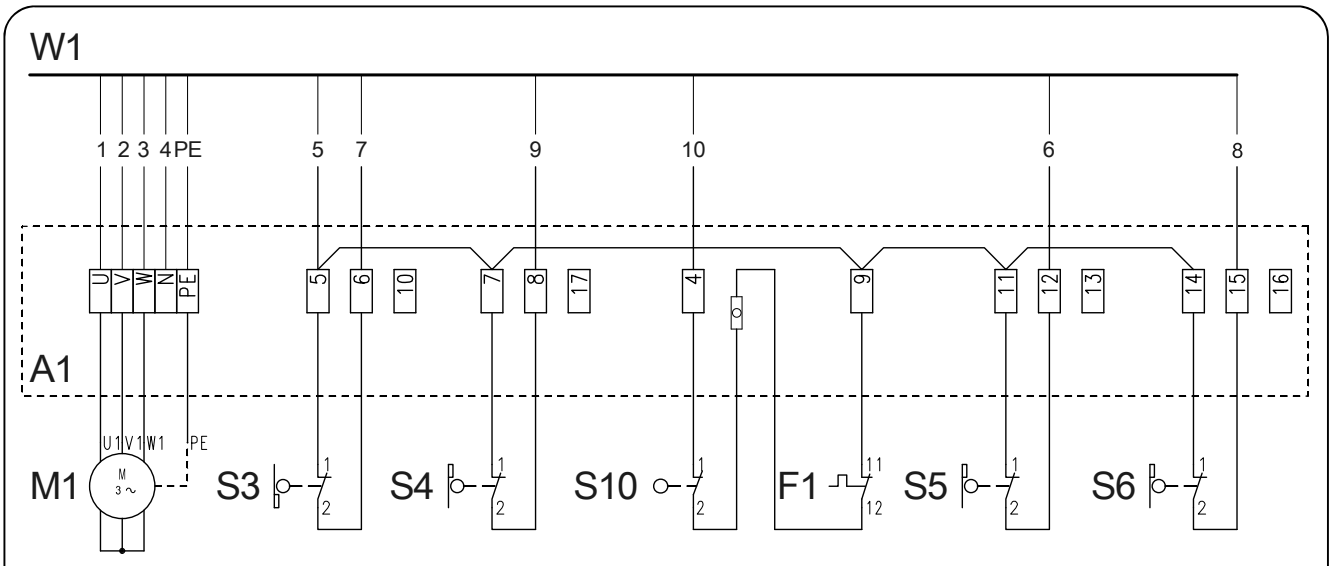
NES Connection cable			
NES		**X12**	Limit switch plug
Pin	Core	Term.	
1	5/wh	**11**	Limit switch common +24 V, wire link on X12 5, 7, 9, 11, 14
2	6/bn	**12**	S5 Additional limit switch, testing or safety edge function
3	7/gn	**6**	S3 Open limit switch
4	8/ye	**15**	S6 Additional limit switch, relay function or intermediate open
5	9/gy	**8**	S4 Closed limit switch
6	10/pk	**4**	Safety circuit

Limit switch assignment for screwable version until year of manufacture of 1997



F1	Thermal contact	**X12**	Limit switch board
G1	Rectifier	**S1**	Emergency open limit switch
M1	Motor	**S2**	Emergency close limit switch
S10	Emergency manual operation	**S3**	Open limit switch
W1	Connection cable	**S4**	Close limit switch
Y1	Spring-loaded brake	**S5**	Auxiliary limit switch
		S6	Auxiliary limit switch

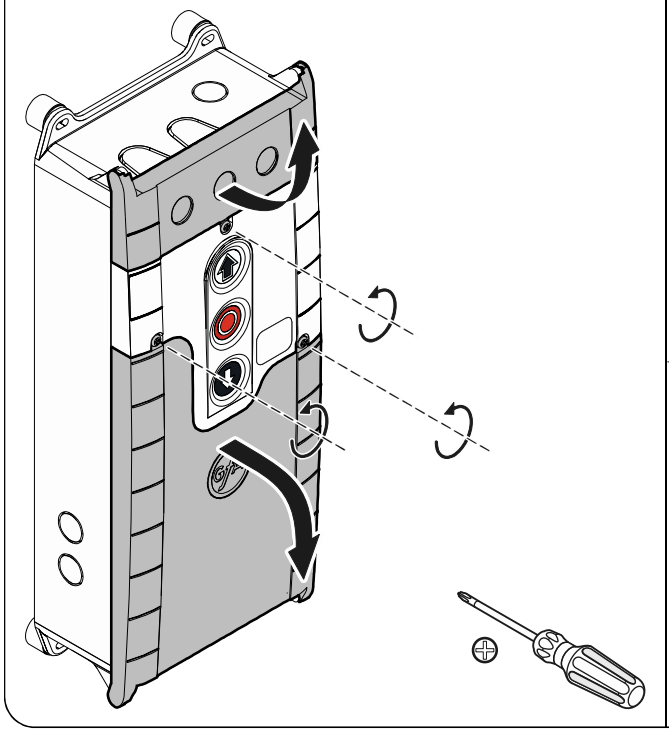
Assignment of individual limit switches



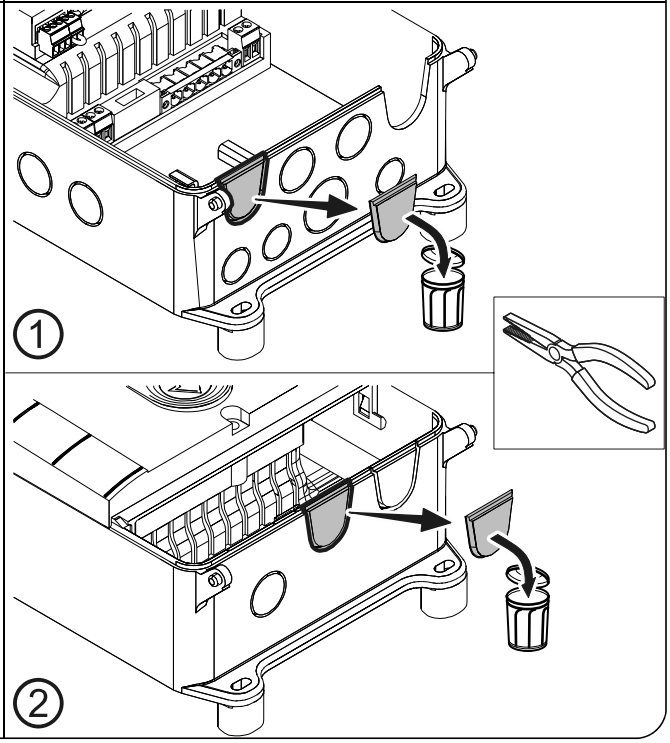
A1	Terminal box	**S3**	Open limit switch
F1	Thermal contact	**S4**	Close limit switch
M1	Motor	**S5**	Auxiliary limit switch
S10	Emergency manual operation	**S6**	Auxiliary limit switch
W1	Connection cable		

Carrying out the electrical installation

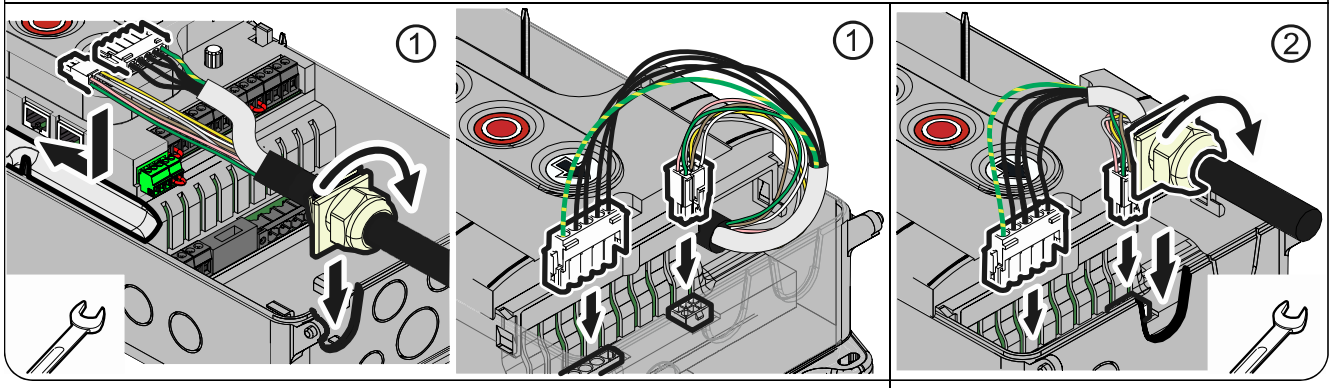
- Remove covers.



- Open cable entry ① or ②.



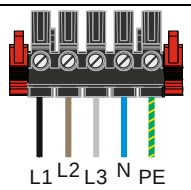
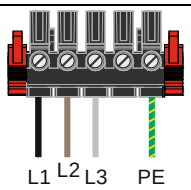
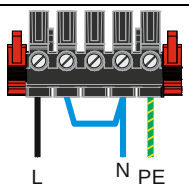
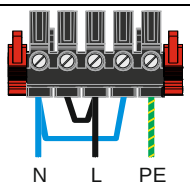
- Insert and connect connection cable in the open cable entry ① (from below) or ② (from above).
- Properly tighten cable glands.

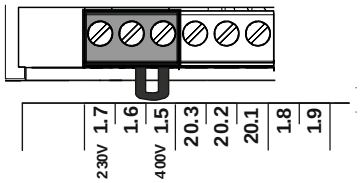
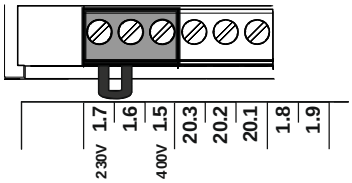


Caution - Damage of components!

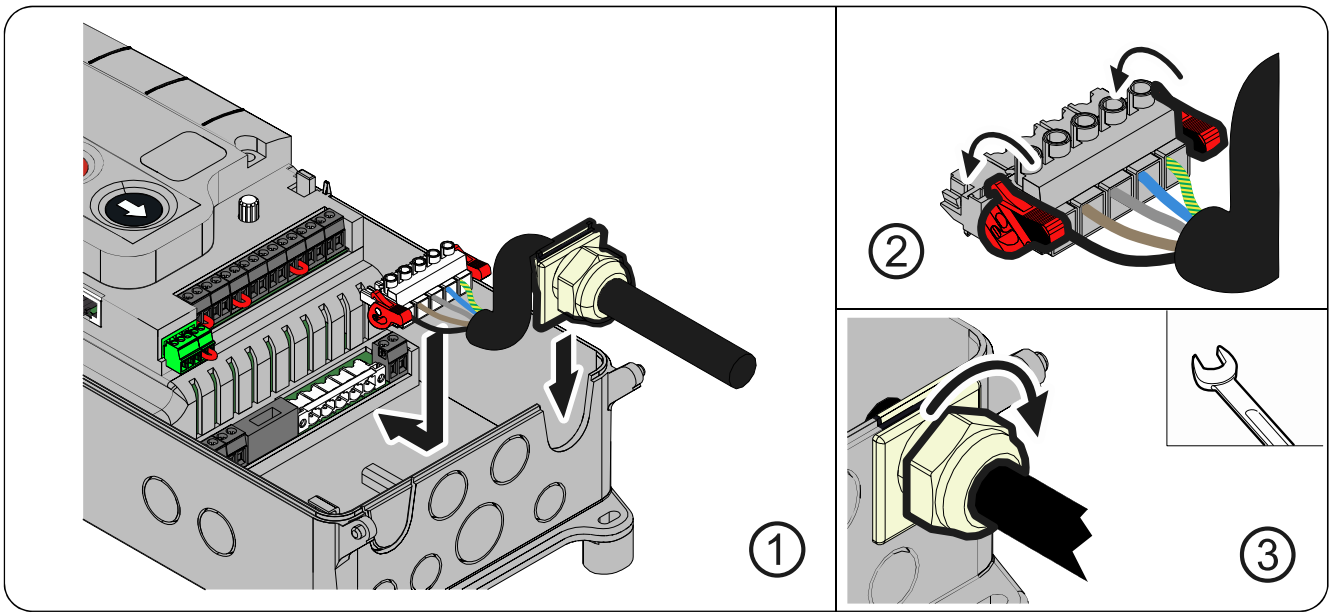
- Open cable entry with suitable tool
- Install cable entries and/or cable glands

Mains connection

3~, N, PE 190 – 440 V 50 -60 Hz	3~, PE 190 – 440 V 50 -60 Hz	1~, N, PE, sym. 190 – 230 V 50 -60 Hz	1~, N, PE, asym. 190 – 230 V 50 -60 Hz
		 ≠ SI 25.15WS, SI 45.7WS	 = SI 25.15WS, SI 45.7WS

3 x 400V	1 x 230V / 3 x 230V
	

Mains connection to control



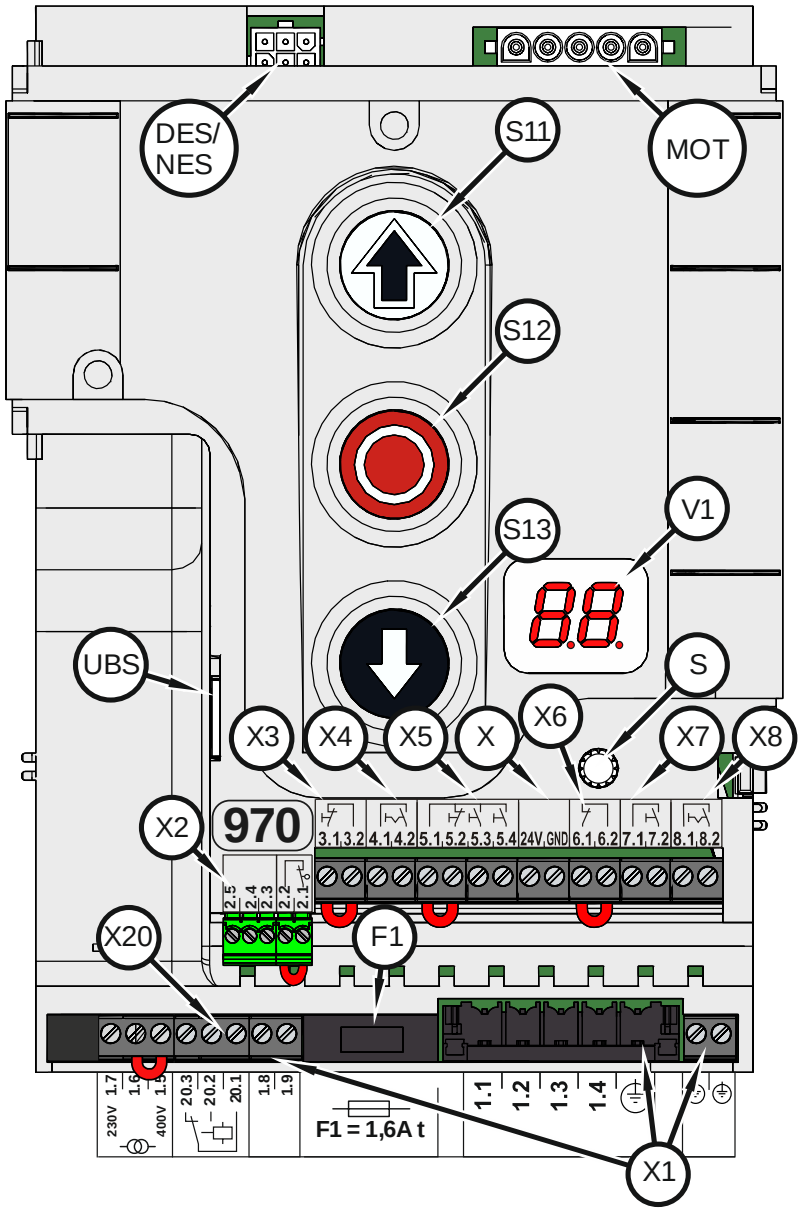
Completing the electrical installation

Connect any other control devices and/or safety devices.

Install and tighten cable entries and/or cable glands.

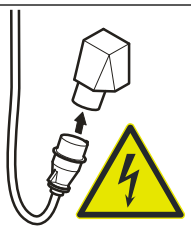
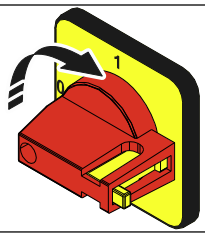
For initial operation, leave the control covers open.

Overview of control



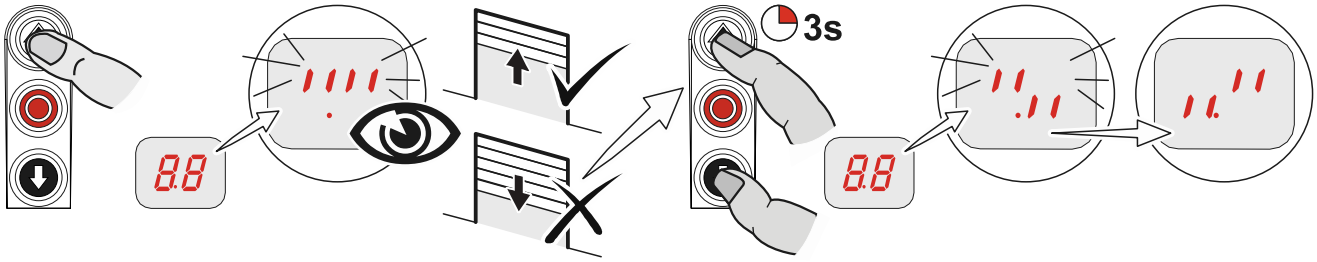
DES/ NES	DES or NES limit switch socket	**X**	24 V mains supply, external devices
		X1	Mains supply
F1	Micro-fuse 1.6 A time lag	**X2**	Safety edge system and Door safety switch
MOT	Motor socket		
S	Selector switch	**X3**	Emergency stop button
S11	Open push-button	**X4**	Automatic closing On/Off
S12	Stop button	**X5**	Control device, external three push-button
S13	Close push-button	**X6**	Through photo cell, reflective photo cell
UBS	Universal command sensor socket	**X7**	Pull switch
V1	Display	**X8**	Intermediate open On/Off
		X20	Potential-free relay contact 1

5 Starting up the control

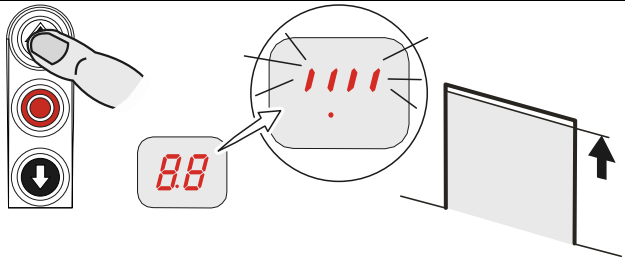
▸ Plug in or switch on the mains supply line		

DES: Rapid adjustment of final limit positions

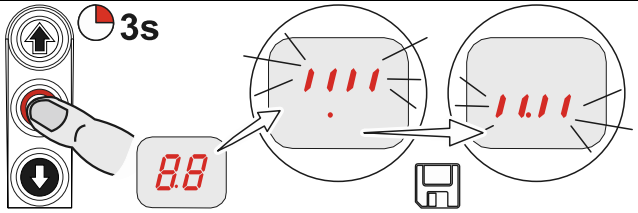
1. Check rotating direction



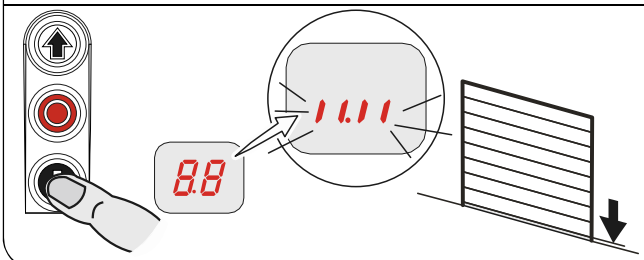
2. Move to open final limit position



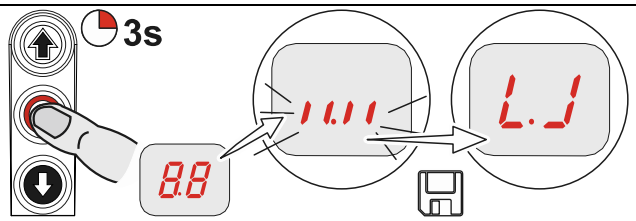
3. Save open final limit position



4. Move to close final limit position



5. Save close final limit position



Note!

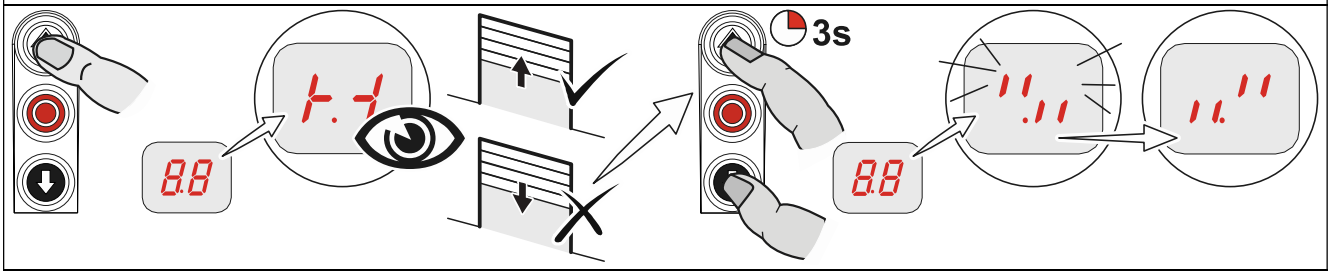
- Rapid adjustment is complete, "Hold-to-run" door operating mode is active
- Change of OPEN/CLOSE final limit positions via menu items "1.1" to "1.4"
- Pre-limit safety edge adjusts automatically
- Changing the pre-limit position is possible via menu item "1.5"

Read the drive unit installation instructions!

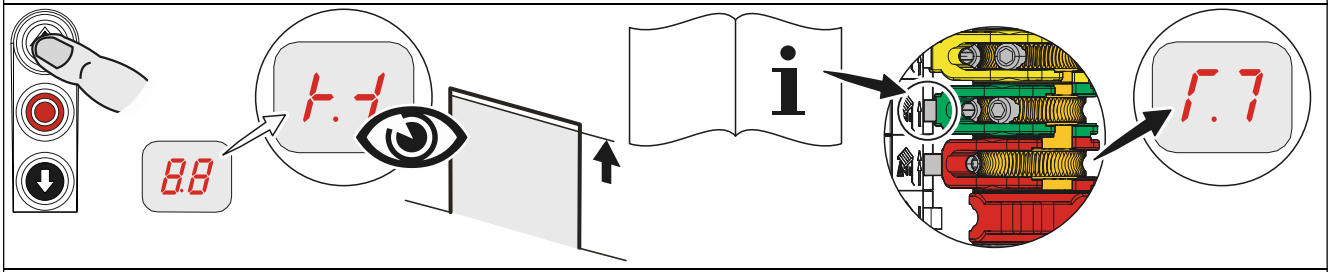
- For adjusting the mechanical limit switch, see the drive unit installation instructions

NES: Rapid adjustment of final limit positions

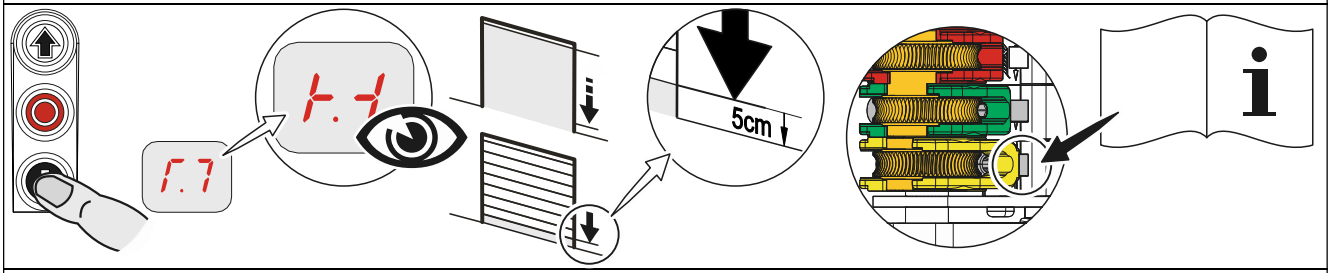
1. Check rotating direction



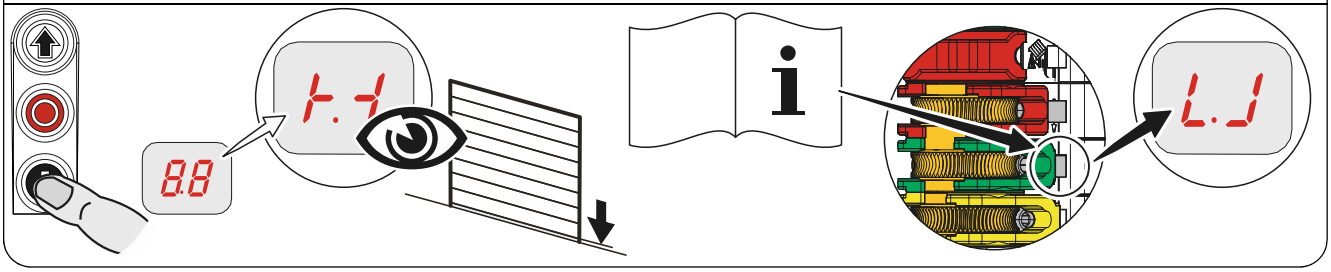
2. Move to open final limit position and adjust S3 OPEN limit switch



3. Move to close position 5cm above the ground and adjust S5 pre-limit switch

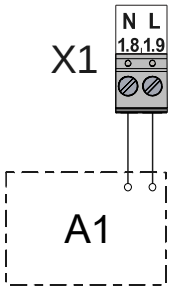


4. Move to close final limit position and adjust S4 CLOSE limit switch



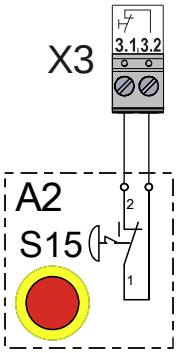
6 Electrical installation – control accessories

X1 External supply



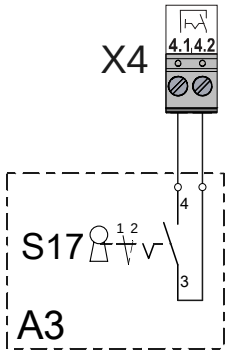
A1	External device

X3 Emergency stop



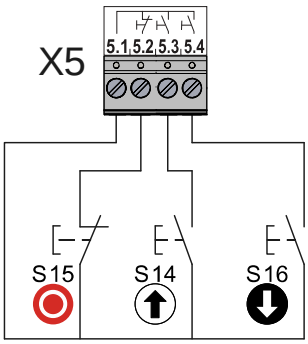
A2	Control device Emergency stop

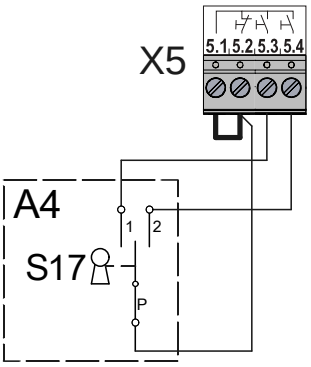
X4 Automatic closing On/Off

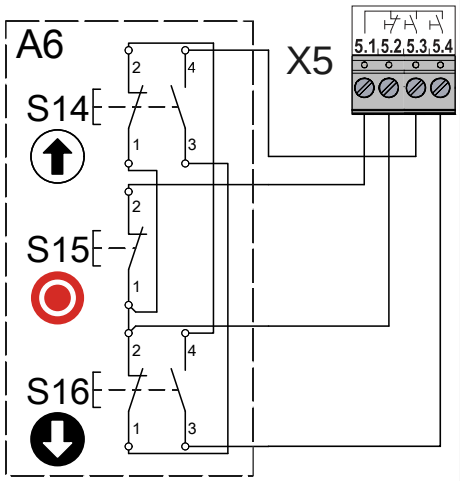


A3	Control device Key-switch

X5 Control device

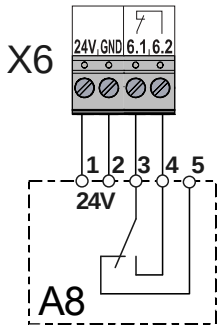


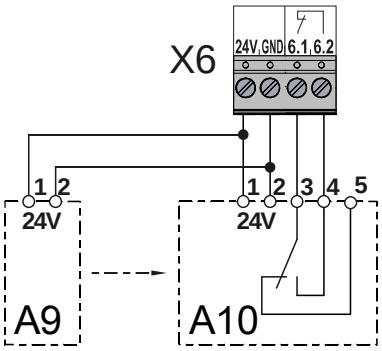


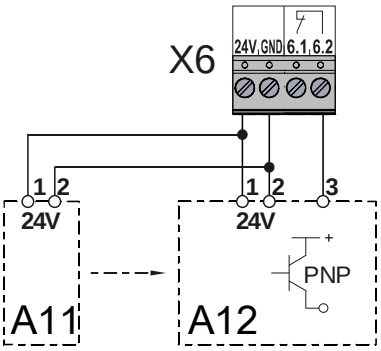


A4	Key-switch
A6	Three push-button

X6 Photo cell

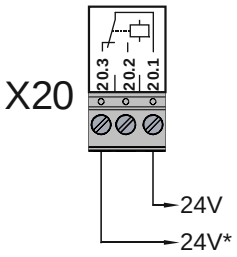




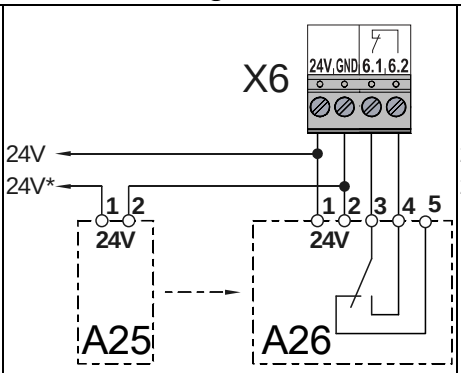


A8	Reflective photo cell
	Through photo cell
A9	Transmitter
A10	Receiver
	Through photo cell
A11	Transmitter
A12	Receiver

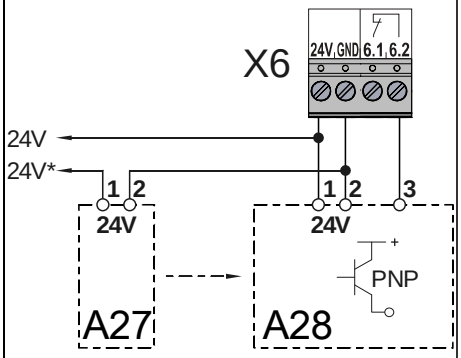
X6 Light curtain



X20	Function relay Test light curtain

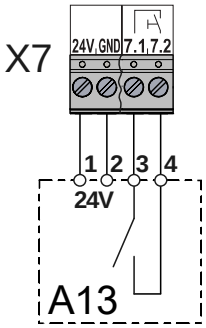


	Light curtain
A25	Transmitter
A26	Receiver

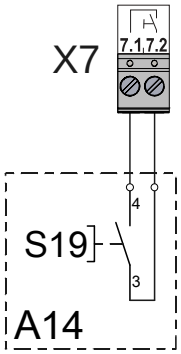


	Light curtain
A27	Transmitter
A28	Receiver

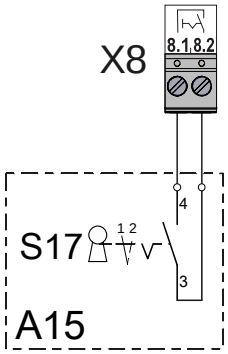
X7 Radio receiver



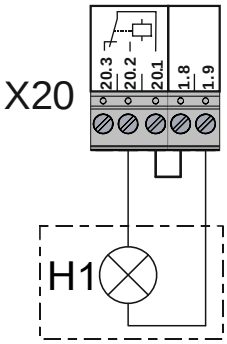
X7 Pull switch



X8 Intermediate stop

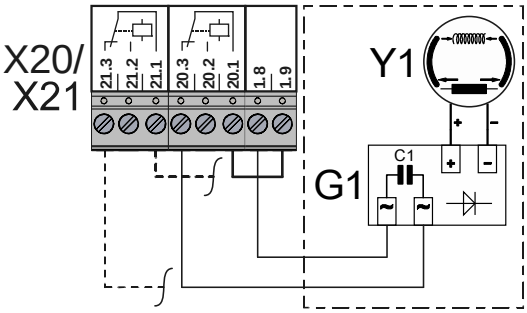


X20 Traffic light



H1	Traffic light

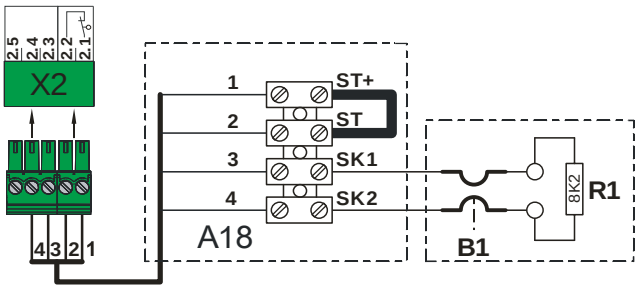
X20 Magnetic brake



G1	Rectifier
Y1	Magnetic brake

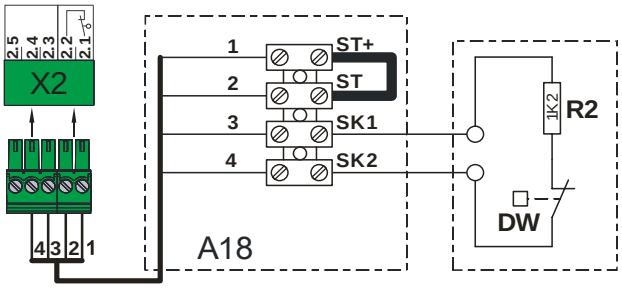
Spiral cable connection

Electrical safety edge system



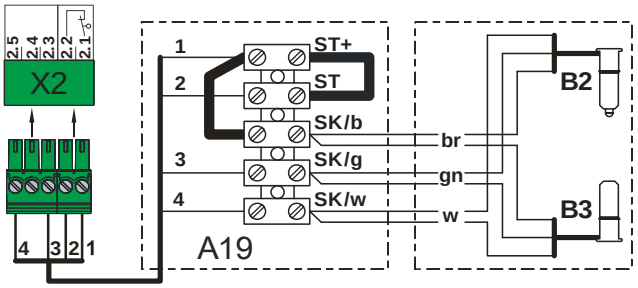
A18 Junction box
ST+ Voltage supply
ST Door safety switch input
SK1, SK2 Electrical safety edge system input
B1 Electrical safety edge system
R1 End of line resistor 8k2
X2 Door control socket

Pneumatic safety edge system



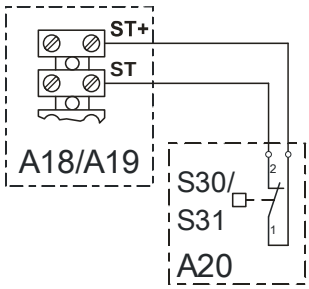
A18 Junction box
ST+ Voltage supply
ST Door safety switch input
SK1, SK2 Pneumatic safety edge system input
DW Pneumatic switch
R2 Series resistor 1k2 testing
X2 Door control socket

Optical safety edge system



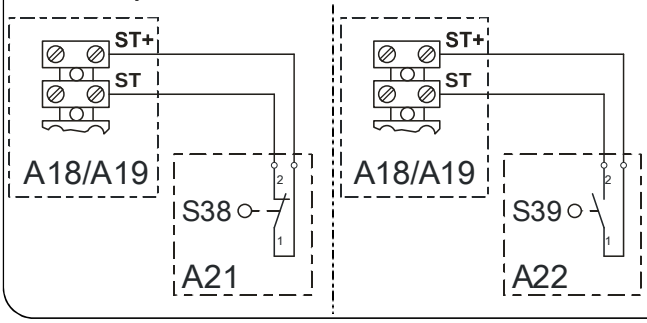
A19 Junction box
ST+ Voltage supply
ST Door safety switch input
SK/b Mains supply (brown)
SK/g Output (green)
SK/w Ground (white)
B2 Optical transmitter
B3 Optical receiver
X2 Door control socket

Door safety switch



A18, **A19** Junction box
A20 Junction box switch
S30 Pass-door switch (NC)
S31 Slack-rope switch (NC)

Door safety switch, crash switch



A18, **A19** Junction box
A21 Junction box switch
S38 Crash switch (NC)
A22 Junction box switch
S39 Crash switch (NO)

Note!

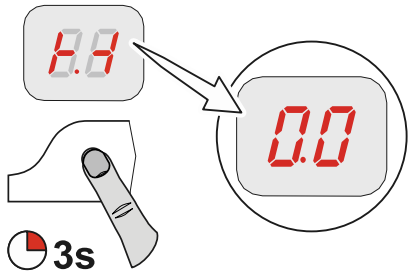
- Use of a safety edge system only possible via menu "0.1", door operating mode "3", "4" or "6"

Completing the electrical installation

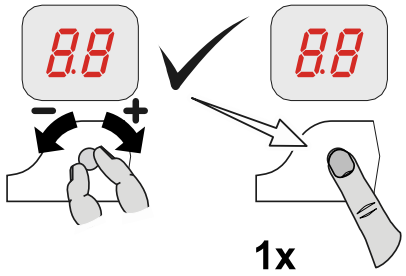
If required, connect other electrical equipment and/or safety devices, install cable entries and/or cable glands.

7 Control programming

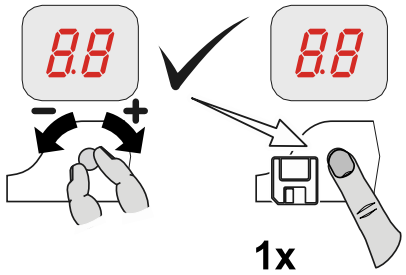
1. Programming can only be accessed after rapid adjustment of final limit positions!



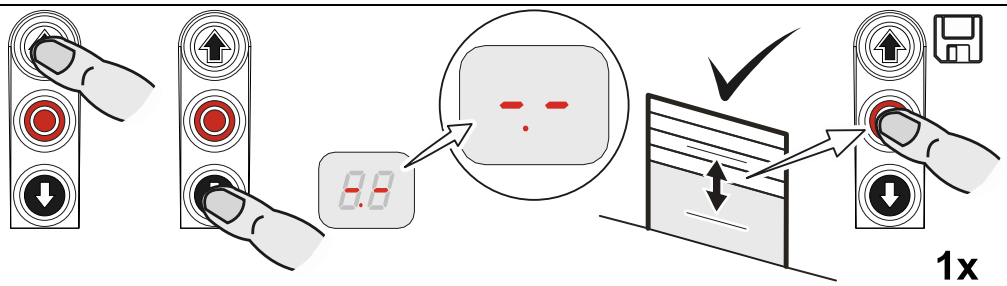
2. Select menu item and confirm



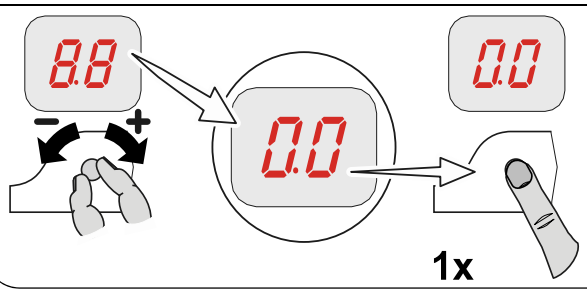
3.a) Set and save functions



3.b) Set and save positions



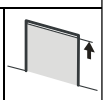
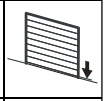
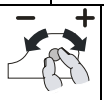
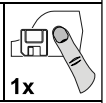
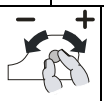
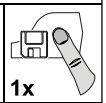
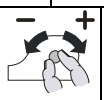
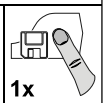
4. Exit programming



8 Table of menu items

Operating mode				
0.1	1x	**Door operating mode**		
	.1	OPEN Hold-to-run CLOSE Hold-to-run	1x	
	.2	OPEN Self-hold CLOSE Hold-to-run		
	.3	OPEN Self-hold CLOSE Self-hold		
	.4	OPEN Self-hold CLOSE Self-hold, CLOSE hold-to-run release via external X5 control device		
	.6	OPEN Hold-to-run CLOSE Hold-to-run with active safety edge system		
0.2	1x	**Rotating direction**		
	.0	Maintain rotating direction	1x	
	.1	Change rotating direction	3s	

Door positions

1.1 1x	**OPEN final limit position, coarse correction (DES)**	 
 -.-	OPEN/CLOSE door movement	 1x
1.2 1x	**CLOSE final limit position, coarse correction (DES)**	 
 _.-	OPEN/CLOSE door movement	 1x
1.3 1x	**OPEN final limit position, fine correction (DES)**	
 -.0 _.9 -.9	Without door movement, [+] correct in OPEN [–] correct in CLOSE	 1x
1.4 1x	**CLOSE final limit position, fine correction (DES)**	
 -.0 _.9 -.9	Without door movement, [+] correct in OPEN [–] correct in CLOSE	 1x
1.5 1x	**Pre-limit safety edge, fine correction (DES)**	
 -.0 _.9 -.9	Without door movement, [+] correct in OPEN [–] correct in CLOSE	 1x
1.6 1x	**Intermediate open**	 
 -.-	OPEN/CLOSE door movement For NES: Set additional S6 limit switch	 1x
1.7 1x	**Adjust position of relay switching point** Select relay function via menu item 2.7	 
 -.-	OPEN/CLOSE door movement For NES: Set additional S6 limit switch	 1x

Door functions part 1

2.1	1x	**Safety edge function in the pre-limit area**		
	.1	Safety edge system active	1x	
	.2	Safety edge system inactive		
	.3	Ground adjustment (DES) (activate safety edge system at contact with ground)		
	.4	Reversing upwards in the overrun area (DES)		
2.2	1x	**Overrun correction (DES)**		
	.0	Off	1x	
	.1	On (do not use in conjunction with ground adjustment)		

Door functions part 2

2.3	1x	**Automatic closing** → 0.0
0.0 – 2.- – 4.0		0 to 240 seconds → 1x
2.4	1x	**Advanced photo cell function**
.0		Off → 1x
.1		Cancel automatic closing and CLOSE command
.2		Vessel recognition Cancel automatic closing and CLOSE command if photo cell is activated > 1.5 seconds
2.5	1x	**Reversing** → 0.2
0.0 – 1.0		0 = Off 1 to 10 safety device activations → 1x
2.6	1x	**Pull switch or radio receiver function X7**
.1		Pulse type 1 Door is not in OPEN final limit position — OPEN command Door is in OPEN final limit position — CLOSE command → 1x
.2		Pulse type 2 command sequence OPEN – STOP – CLOSE – STOP – OPEN
.3		Pulse type 3 OPEN command only

Door functions part 3

2.7	1x	**Relay function on X20** Teach in door position via menu 1.7 (DES only)	
	.0	Off	1x
	.1	Pulse signal for 1 second	
	.2	Permanent signal	
	.3	Red lamp, permanent light during door movement OPEN final limit position 3 seconds flashing CLOSE final limit position 3 seconds flashing	
	.4	Red lamp, permanent light during door movement OPEN final limit position 3 seconds flashing CLOSE final limit position Off	
	.5	Red lamp, permanent light during door movement OPEN final limit position 3 seconds permanent light CLOSE final limit position 3 seconds permanent light	
	.6	Red lamp, permanent light during door movement OPEN final limit position 3 seconds permanent light CLOSE final limit position Off	
	.7	Dock leveller release or permanent green light Is active only in OPEN final limit position	
	.8	Permanent contact in CLOSE final limit position	
	1.0	Light sensing device 1 second pulse at each OPEN command	
	1.1	Permanent contact at door position	
	1.2	Brake control Active during operation Inactive at stop	
	1.4	Light curtain test, etc. Test prior to each closing operation	

Door functions part 4

2.9 1x	**Partly open function**	
.1	All command inputs active	1x
.2	Input X7.2 active	
.3	Input X5.3 and OPEN push-button active	

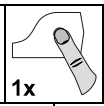
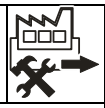
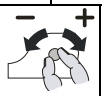
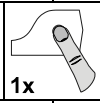
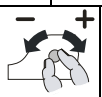
Safety functions

3.1 1x	**Force monitoring (DES)**	.0
.0	.2 ◢ 1.0 0 = Off Adjustable from 2 % to 10 % overload	1x
3.2 1x	**Interruption to photo cell operation**	
.0	Off	1x
.1	On (teach-in the same reference position twice)	
3.3 1x	**Travel time monitoring (NES) only**	9.0
0.0 ◢ 9.0	0 = Off 0 to 90 seconds	1x
3.4 1x	**Door safety switch function** (input X2.2)	
.1	Slack-rope or pass-door switch	1x
.2	Crash detector (NC contact) Hold-to-run after activation	
.3	Crash detector (NO contact) Hold-to-run after activation	
3.8 1x	**Reversing duration adjustment**	-.0
-.0	_.1 ◢ -.3 [+] slower [–] faster	1x

DU/FI settings

4.1	1x	**OPEN output speed**
0.0		Output speed in rpm 1x
4.2	1x	**CLOSE output speed**
0.0		Output speed in rpm 1x
4.3	1x	**Increased CLOSE output speed** To opening height of 2.5 m
0.0		Output speed in rpm 0 = Off 1x
4.4	1x	**Changeover position to CLOSE output speed** (observe minimum opening height of 2.5 m!)
- -		OPEN/CLOSE door movement 1x
4.5	1x	**OPEN acceleration**
0.0		DU Steps of 1.0 seconds FI Steps of 0.1 seconds 1x
4.6	1x	**CLOSE acceleration**
0.0		DU Steps of 1.0 seconds FI Steps of 0.1 seconds 1x
4.7	1x	**OPEN brake**
0.0		DU Steps of 1.0 seconds FI Steps of 0.1 seconds 1x
4.8	1x	**CLOSE deceleration**
0.0		DU Steps of 1.0 seconds FI Steps of 0.1 seconds 1x
4.9	1x	**OPEN/CLOSE crawling speed**
0.0		Output speed in rpm 1x

Maintenance cycle counter

05	 1x	**Maintenance cycle adjustment**					00	
	00		01		99	01-99 corresponds to 1,000 to 99,000 cycles Cycles are counted down	 1x	
06	 1x	**Reaction on reaching zero**						
	.1	"CS" display with set value of maintenance cycle					 1x	
	.2	Changeover to hold-to-run and "CS" display with set value of maintenance cycle						
	.3	Changeover to hold-to-run and "CS" display with set value of maintenance cycle. Pressing the Stop button for 3 sec re-enables 500 automatic cycles						
	.4	"CS" display with set value of maintenance cycle and relay contact switches X20						

Readout information store

9.1 Cycle counter reading

1x

7-digit number

M HT ZT T H Z E

Cycle counter reading in divisions of ten consecutively

M = 1,000,000 **ZT** = 10,000 **H** = 100 **E** = 1
HT = 100,000 **T** = 1,000 **Z** = 10

9.2 Last Fault

1x

The six most recent faults are indicated alternately

9.3 Cycle counter reading of the last programming change

1x

7-digit

M HT ZT T H Z E

Cycle counter reading in divisions of ten consecutively

M = 1,000,000 **ZT** = 10,000 **H** = 100 **E** = 1
HT = 100,000 **T** = 1,000 **Z** = 10

9.4 Firmware version

1x

The firmware version of the control is displayed.
In conjunction with DU or FI, additional firmware version of DU or FI.

Clear

9.5 Clear all settings

1x

.0		1x
.1	All (factory setting)! Except for cycle counter	3s

9 Safety devices

X2: Input, door safety switch

The door safety switch is installed on the door and connected to the door control via the spiral cable.

Menu item "3.4“:

Function type	Reaction upon activation
"1“ Slack-rope/pass-door	• Switching contact is interrupted: Door stop
	• Switching contact is closed: Door is ready for operation
"2" Crash switch as NC contact	• Door stop • Changeover to hold-to-run mode • Frequency inverter: Hold-to-run mode at crawling speed only • Fault reset only possible in OPEN final limit position: Press the stop button of the door control for 3 seconds
"3" Crash switch as NO contact	As function type "2"

Slack-rope/pass-door

If the switch is open and simultaneously the command from the final limit positions is active, the “F1.2” fault indication is displayed. If activation occurs during the door movement, there is an immediate stop and the “F1.2” fault indication is displayed.

Pass-door switch: Entry sense

The switch, tested in performance level c (plc) category 2 (as defined in EN 13849-1), is monitored by the door control. If the switch is open and simultaneously the command from the final limit positions is active, the “F1.2” fault indication is displayed. If activation occurs during the door movement, there is an immediate stop and the “F1.2” fault indication is displayed.

The magnetic contacts in the switch are switched by a permanent magnet. The door control assesses the switching status of the contacts independently of each other.
The “F1.7” fault indication appears if there is a fault.

Crash switch as NC or NO contact

The crash switch is activated if the door is pushed out of the guides.
If the switching contact is activated, the door is stopped, fault F4.5 is displayed, and a changeover to "hold-to-run" is carried out. The door can be moved only via the integrated push-buttons of the door control. Hold-to-run mode is only possible at crawling speed with frequency inverter operation.
The fault "4.5" can only be reset in OPEN final limit position by pressing the STOP push-button of the door control for more than 3 seconds or by switching the mains voltage off and on. Fault "F4.5" will recur, if the switching contact continues to be activated.

X2: Input, safety edge system

The door control automatically detects three different safety edge systems.

Important!

- Connect safety edge systems in accordance with EN 12978
- The hold-to-run mode can always be used should the safety edge system be defective

1K2 resistor evaluation

This safety device is intended for a pneumatic switch with an NC contact connected in series with an end of line resistor of 1K2, +/-5 %, and 0.25 W. If activated, pressure is generated in the rubber profile which activates the pneumatic switch.
The safety edge system must be tested in the CLOSE final limit position. The "pre-limit safety edge system" door position test is used for conducting the test. Should the door move past the pre-limit position when it closes, two seconds will start to lapse. Within this time frame pressure must be generated by the safety edge system from it contacting the ground. If the pneumatic switch is not activated, the test has failed (is negative) and the "F2.8" fault indication is displayed.
If there is a short circuit in the safety edge system, fault "F2.7" is displayed.
Upon activation of the safety edge system or permanent disconnection of the current circuit, the "F2.6" fault indication appears.

8K2 resistor evaluation

This safety device is intended for an electrical safety edge system with an end of line resistor of 8k2, +/- 5 % and 0.25 W. If activated, there is a short circuit and fault "F2.4" is displayed. If there is an open circuit, the "F2.5" fault indication appears.

Optical safety edge system

The functional principle is based on a through-beam photo cell fitted into the leading edge rubber strip. If activated, the light beam is interrupted.
Fault “F2.9” is displayed if the safety edge system is activated or faulty.

Installation of the spiral cable

The spiral cable should enter the door control panel from the left- or right-hand side and should be fixed in place with a cable gland. The safety edge system is connected via the 3-pole plug, and the slack-rope or the pass door via the 2-pole plug.

Important!

- ▸ Check the pre-limit safety edge position
- At a door opening height > 5 cm, reversing must occur after activation of the safety edge system

Function of the safety edge system in the pre-limit area

Menu "2.1":

Function	Reaction upon activation of the safety edge system
"1" Active	• Stop
"2" Inactive	• No reaction • Door moves to CLOSE final limit position
"3" Ground adjustment (DES)	• Stop; correction of the CLOSE final limit position at the next closing
"4" Reversing in the overrun area (DES)	• Reversing upwards from the overrun area upon activation of the safety edge system

Note: Ground adjustment!

- Automatic compensation of rope elongations or changes in ground conditions of approx. 2-5 cm
- With DES limit switch only
- Do not use with overrun correction
- Do not use with pneumatic switch

Note: Reversing upwards in the overrun area!

- To maintain the operating forces in the pre-limit area
- At high speeds
- With DES limit switch only
- Function for FI-drive units not necessary

Overrun correction function

Menu "2.2":

Automatic limit switch correction to achieve a constant CLOSE position.

Function	Overrun correction
"0"	Off
"1"	On

Note: Overrun correction!

- With DES limit switch only
- Do not use with ground adjustment

Reversing function

Menu "2.5":

Limiting of the number of reversing movements following safety edge system activations via automatic closing.

If the set value is exceeded, automatic closing is deactivated and the "F2.2" fault indication is displayed.

Note!

- To reset fault "F2.2": Move to CLOSE final limit position

X3: Input, emergency stop

Connection of an emergency stop control device as per EN 13850 or an evaluation unit for an anti-trap safety device. The “F1.4” fault indication appears upon activation.

Note!

- FI-drive units: Drive units are de-energised as a result of an emergency stop

10 Functional description

X: 24 V DC voltage supply

Connection of external devices such as photo cell, radio receiver, relay, etc. via the 24 V and GND terminals.

Caution - Damage of components!

- Total current consumption of external devices: maximum 180 mA

X1: Mains supply line for control and external supply

Mains supply line for control

Connection via terminals X1/1.1 to X1/1.4 and PE.

Various mains supply connections: 3 N~, 3~, 1 N~ for symmetric and asymmetric motors.

400V mains = 1.5 - 1.6 wire link

230V mains = 1.6 - 1.7 wire link

Note!

- ▸ Pay attention to the "Mains supply connection" and "Mains supply connection to control" descriptions

External supply

Connection of external devices for 230 V, such as photo cell, radio receiver, relay, etc. via terminals X1/1.8 and X1/1.9.

Note!

- Supply of external devices 3 N~400 V or 1 N~230 V, symmetric
- Protection via F1, 1.6-A time-lag micro-fuse

X4: Input, automatic closing Off/On

Connection of a switch via terminals X4/1 and X4/2 for switching the automatic closing off and on.

X5: Control device

Warning!

- "Hold-to-run" door operating mode:
  The door must be fully visible from the operating point

Door operating mode "3" allows a place of installation of the control device without sight of the door.

Note!

- Application without STOP push-button: Connect wire link X5.1 to wire link X5.2
- If the safety edge system or photo cell fails, the control device will not function.

X6: Input, through / reflective photo cell or light curtain

Photo cell

A photo cell is used for presence detection. It is only active in door operating modes "3" and "4", in the OPEN final limit position or during the closing operation.

If the photo cell is interrupted, fault indication "F2.1" appears.

Light curtain

The light curtain must be self-testing and correspond at least to safety category 2 or performance level c (plc). If the light curtain corresponds to these requirements, the door can close into self-hold without safety edge system.

Important!

- Operation without safety edge system, connect 8K2 resistor via terminals X2/3 and X2/4
- Photo cells must not be used via the UBS system
- Do not use menu item "3.2" for the light curtain

- To test the light curtain, activate relay contact X20.

For a description of the relay functions see menu item "2.7".

If the photo cell is interrupted, fault indication "F4.6" appears.

Testing is carried out at each CLOSE command, the contact of the light curtain must switch off within 100 ms. If the test is positive, the contact must switch back on within 300 ms. If the test fails, fault indication "F4.7" appears.

- To reset fault indication "F4.7": Switch control off and on.

Note!

- Only use photo cells or light curtains with "Light switching" mode

Effect of interrupting the photo cell

Door position	Effect of interrupting the light beam
CLOSE final limit position	• No action
Upwards travel	• No action
OPEN final limit position Without automatic closing	• No action
OPEN final limit position With automatic closing	• Reset automatic closing
OPEN final limit position With automatic closing and interruption to timer	• The door closes 3 seconds after the interruption period for the light beam has ended

Advanced photo cell function

Menu "2.4":

Function	Advanced photo cell function
"0"	• No action
"1" Cancel automatic closing	• The door closes 3 seconds after the interruption period for the light beam has ended
"2" Vehicle recognition	• The door closes after the interruption period for the light beam has ended, if the interruption period is longer than 1.5 seconds • Reset of automatic closing if the interruption duration for the light beam is equal to or less than 1.5 seconds

Interruption to photo cell operation

Menu item "3.2"

Function type	Interruption to photo cell operation
"0"	Off
"1"	On

Teach-in mode first active when exiting the programming.

Warning!

- Presence detection is disabled in the teach-in mode

In the teach-in mode, the door must be fully opened and closed twice. The photo cell must be interrupted twice at the same door position. The teach-in mode is then terminated. The photo cell has no function below this stored door position.

Teach-in mode display	
Upon exiting the programming	
When the light beam is interrupted for the first time	
After the second interruption to the light beam at the same door position, and with the CLOSE final limit position reached	

Note!

- If the teaching-in is not successful, open and close the door again, so that two identical door positions are stored

X7: Input, pull switch/radio receiver

Connection of a pull switch or external radio receiver via terminals X7/1 and X7/2. The switching contact must be potential-free (NO contact).

Pull switch or radio receiver function

Menu item "2.6":

Pulse type	Reaction upon activation
"1"	• The door CLOSES from the OPEN final limit position or the intermediate stop position • The door OPENS from all other door positions or door movements
"2"	• OPEN-STOP-CLOSE-STOP-OPEN command sequence
"3"	• Door always executes OPEN movement

X8: Input, intermediate open On/Off

Connect a switch to terminals X8/1 and X8/2 to activate and deactivate the intermediate open. Set the intermediate open position via menu item “1.6”.
With an OPEN command, the door moves to the stored door position. When the intermediate open function is deactivated, the door can move back to the OPEN final limit position.

Partly open function

Menu item "2.9":

Function	Intermediate stop
"1"	• All command inputs
"2"	• Intermediate stop via X7; • OPEN final limit position via all other control devices
"3"	• Intermediate stop via external X5 control device and internal control device • OPEN final limit position via all other control devices

Note!

- Double command with functions "2" and "3": Priority is given to OPEN final limit position, independent of command sequence

X20: Potential-free relay contact

The relay functions are described under menu item "2.7".

Caution - Damage of components!

- Maximum current of 1 A at 230 VAC and 0.4 A at 24 VDC
- We recommend the use of LED lamps
- When using light bulbs, these should have power of maximum 40 W and be shock-proof

Force monitoring (DES only)

Menu item "3.1":

The force monitoring function can only be used with fully balanced doors and drive units with DES switches. It should be able to detect when persons are moving with the door.

Warning!

- The force monitoring is no substitute for safety measures in providing protection against the trapping hazard

Function	Force monitoring
"0"	• Off
"2" - "10"	• 2 - low limit value • 10 - high limit value

Important!

- Force monitoring for doors with spring balance only
- Environmental factors such as temperature or wind load can lead to inadvertent triggering of the force monitoring

After exiting programming, the door must carry out a full opening and closing operation in self-hold mode.
The force monitoring is a self-learning system which is effective for an opening width range of 5 cm to 2 m (approx.). Slow progressive changes, e.g. gradual reduction of the spring torsion, are compensated for automatically.
If force monitoring is triggered, only the "hold-to-run" door operating mode is possible and the "F4.1" fault indication is displayed. Resetting occurs when a final limit position for the door is reached.

Travel time monitoring (NES only)

Menu item "3.3"
The set travel time is automatically compared with the time measured for movement between the final limit positions. If the travel time is exceeded, the "F5.6" fault indication appears.
Fault indication "F5.6" is reset by closing the door.

Note!

- The travel time is set at the factory to 90 seconds
- Recommended setting value: Door travel time + 7 seconds

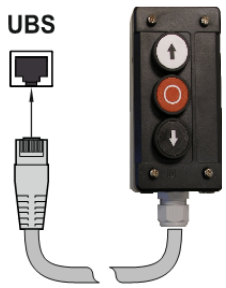
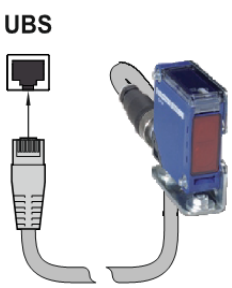
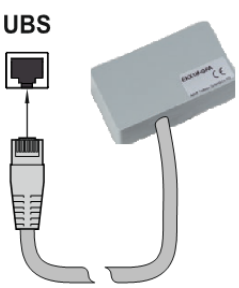
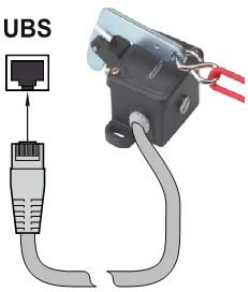
UBS system

The UBS system is a simple pluggable connection technology from GfA. The control devices are connected to the control by a commercially available patch cable and detected automatically.

Note!

- The UBS devices function in the same way as wired control devices

UBS connection

			
Three push-button	Reflective Photo cell	External Radio receiver	Pull switch

Reversing duration adjustment

Menu item "3.8":

Shortening the reversing duration will reduce the operating forces. Extending it, on the other hand, will reduce the wear on the door mechanism.

Maintenance cycle counter

Menu item "8.5":

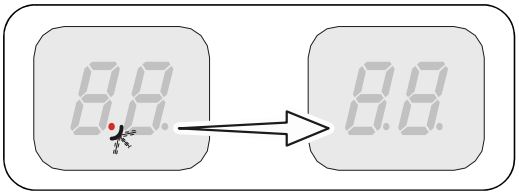
A value between 0 and 99,000, as a multiple of 1000, can be selected for the maintenance cycle setting.

The maintenance cycle counter reading is reduced by one each time the Open final limit position is reached.

Once the maintenance cycle reaches zero, the setting from menu item “8.6” is activated.

Short-circuit/overload display

If there is a short circuit or an overload of the 24 VDC supply voltage, the 7-digit display vanishes.

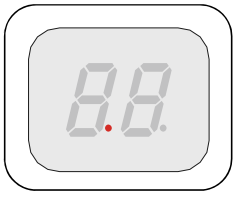


Standby function

If there is no fault or command pending, the control switches the display to "Standby".

Standby is active if the automatic closing duration is longer than 60 seconds.

Only the left point is displayed.



Execution of the “Standby” function is stopped by issuing a command or by operating the “S” selector switch.

11 Status display

Faults		
	Display: "F" and code	
Status-code	Fault description	Measures for fault correction
	Terminals X2.1 – X2.2 are open. Slack-rope/pass-door contact open.	Check door safety switch. Check whether the connection cable is connected.
	DES safety circuit is open. Emergency manual operation has been activated. Thermal protection of the motor has tripped	Check emergency manual operation. Check for overload or stalling of the drive unit.
	Terminal X3.1 – X3.2 is open. Emergency stop has been activated.	Check emergency stop. Check whether the connection cable is connected.
	Faulty "Entry sense" switch. Contact resistances are too high. Faulty entry sense installation.	Open and close pass-door. Check resistance. Check pass-door installation.
	Entry sense input (X2.1 – X2.2) faulty.	Switch control off and on. Replace control if necessary.
	No safety edge is detected.	Check the wiring of the safety edge system.
	Terminals X6.1 – X6.2 are open. Photo cell has been activated.	Check alignment of the photo cell. Check connection cable. Replace photo cell if necessary.
	Maximum number of reversing movements for door through safety edge system activation has been reached. (Only with automatic closing)	Obstacles in the door travel way. Check whether the safety edge system is correctly functioning.

Faults

	Display: "F" and code	
Status-code	**Fault description**	**Measures for fault correction**
	8k2 safety edge system has been activated.	Check whether the safety edge system is correctly functioning. Check whether the connection cable has short-circuited.
	8k2 safety edge system is defective.	Check whether the safety edge system is correctly functioning. Check whether the connection cable is connected.
	1k2 safety edge system has been activated.	Check whether the safety edge system is correctly functioning. Check whether the connection cable is connected.
	1k2 safety edge system is defective.	Check whether the safety edge system is correctly functioning. Check whether the connection cable has short-circuited.
	1k2 testing is negative.	Testing is activated in the lower final limit position. Check pre-limit switch (with NES "S5").
	Optical safety edge system has been activated or is defective.	Check whether the safety edge system is correctly functioning.
	(DES) OPEN emergency stop switch reached.	In the voltage-free state, move the door back via emergency manual operation.
	(NES) OPEN or CLOSE emergency stop switch reached. Emergency manual operation has been activated. Thermal protection of the motor has tripped	Check OPEN/CLOSE emergency stop switch. Check emergency manual operation. Check drive unit for overload or stalling.
	(DES) CLOSE emergency stop switch reached.	In the voltage-free state, move the door back via emergency manual operation.
	(NES) Faulty activation of the "S5" pre-limit position.	Check the "S5" pre-limit position for correct functioning and setting.

Faults

	Display: "F" and code	
Status-code	**Fault description**	**Measures for fault correction**
	No limit switch detected (active at initial start-up).	Connect the limit switch to the control. Check the limit switch connection cable
	Limit switch system has been changed without the control being reset.	Reset the control via menu item "9.5".
	Internal plausibility error.	Fault clearance with next movement command.
	Triggering of the force monitoring.	Check the door mechanism for stiffness.
	Crash detector (X2.1 – X2.2) has been activated.	Check crash detector or connection cable. Reset error, press stop button for 3 seconds.
	Terminal X6.1 – X6.2 is open. Light curtain has been activated.	Check light curtain. Check whether the connection cable is connected.
	Light curtain is defective.	Comply with the light curtain manufacturer's specification/instructions. Check connection cable.
	Controller fault.	Switch control off and on. Replace control if necessary.
	ROM error.	Switch control off and on. Replace control if necessary.
	CPU error.	Switch control off and on. Replace control if necessary.

Faults		
	Display: "F" and code	
Status-code	Fault description	Measures for fault correction
	RAM error.	Switch control off and on. Replace control if necessary.
	Internal control error.	Switch control off and on. Replace control if necessary.
	Digital limit switch error (DES).	Check DES connector and connection cable. Switch control off and on.
	Fault with door movement.	Check the door mechanism for stiffness. Check the limit switches for correct rotational movement. Switch control off and on.
	Fault with rotating direction.	Change rotating direction via menu item "0.2".
	Non-permitted door movement in stopped condition.	Release of failure through command. Check brake and drive unit.
	Drive unit does not follow specified travel direction.	Release of failure through command. Check for overload of the drive unit.
	DU / FI closing speed is too high.	Switch control off and on. Replace drive unit if necessary.
	Internal FI communication failure.	Switch control off and on. Replace FI-drive unit if necessary.
	Low voltage in the DC voltage link.	Release of failure through command. Check mains input voltage. Change slope times/speed.

Faults

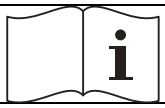
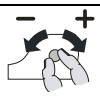
	Display: "F" and code	
Status-code	**Fault description**	**Measures for fault correction**
	Excess voltage in the DC voltage link.	Check mains input voltage. Release of failure through command. Change slope times/speed.
	Temperature limit exceeded.	Drive unit overload. Cool down the drive unit and reduce the number of cycles.
	Permanent current overload.	Check for overload of the drive unit. Check the door mechanism for stiffness or weight.
	Brake / FI fault.	Check brake, replace if necessary. If problem recurs, replace drive unit.
	FI group message.	Release of failure through command. Replace drive unit if message continues to be displayed.
	Minimum way of travel not reached during initial operation.	Move the door for at least 1 second.

Commands	
	Display: "E" and code
Code	**Command description**
	An open command is present. Inputs X5.3, X7.2, UBS control device or UBS radio receiver.
	A stop command is present. Inputs X5.2, X7.2, UBS control device or UBS radio receiver or simultaneous Open and Close command.
	A close command is present. Inputs X5.4, X7.2, UBS control device or UBS radio receiver.

Status indications

Status-display	Description
	Preset value for maintenance cycle counter status reached
	Dot on left is not lit: Control circuit has short-circuited or is overloaded.
	Change of rotating direction activated, only possible at initial start-up.
	Change of rotating direction carried out, only possible at initial start-up.
 Flashing	Programming option is blocked.
 Flashing	Teach-in OPEN final limit position.
 Flashing	Teach-in CLOSE final limit position
 Flashing	UPWARDS travel active.
 Flashing	CLOSING operation active.
	Stop between the set final limit positions.
	Stop at the OPEN final limit position.
	Stop at the intermediate OPEN position.
	Stop at the CLOSE final limit position.
	Blocking of programming option confirmed. Flashing display: Unblocking of programming option active.
	Interruption to photo cell operation: When the light beam is interrupted for the first time.
	Interruption to photo cell operation: Upon exiting the program.

12 Explanation of symbols

Symbol	Explanation
	Prompt: Read installation instructions
	Prompt: Check
	Prompt: Note
	Prompt: Note the setting of the menu item below
	Factory setting of the menu item
	Factory setting of the menu item, value on the right
	Factory setting of the minimum limit, dependent on drive unit
	Factory setting of the maximum limit, dependent on drive unit
	Range
	Prompt: Select menu item or value, turn selector switch to the left or to the right
 1x	Prompt: View menu item, press selector switch once
 1x	Prompt: Save, press selector switch once

Symbol	Explanation
	Prompt: Setting via OPEN/CLOSE built in push-button; Use OPEN push-button to increase value, CLOSE push-button to decrease value
 1x	Prompt: Press stop button once via built in push-button
 1x	Prompt: Save, press stop button once via built in push-button
 3s	Prompt: Save, press stop button for three seconds via built in push-button
 3s	Prompt: Reset the control, press stop button for three seconds via built in push-button
	Prompt: Move to door position
	Prompt: Move to door position for OPEN final limit position
	Prompt: Move to pre-limit
	Prompt: Move to door position for CLOSE final limit position

Declaration of Incorporation

pursuant to Machinery Directive 2006/42/EG for a partly completed machine Appendix II Part B

GfA - Gesellschaft für Antriebstechnik
Dr.-Ing Hammann GmbH & Co KG
Wiesenstraße 81
40549 Düsseldorf

Declaration of Conformity

pursuant to EMC Directive 2004/108/EC

We,

GfA – Gesellschaft für Antriebstechnik,

hereby declare that the product specified in the following complies with the above-mentioned EU Directive and is only intended for installation in a door system

TS 970

Applied standards

DIN EN 12453	Industrial, commercial and garage doors and gates
DIN EN 12978	Safety devices for power operated doors and gates
DIN EN 60335-1	Household and similar electrical appliances - Safety – Part 1: General requirements
DIN EN 61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2 Generic standards - Immunity for industrial environments
DIN EN 61000-6-3	Electromagnetic compatibility (EMC) - Part 6-3 Generic standards - Emission standard for residential, commercial and light-industrial environments

We undertake to transmit, in response to a reasoned request by the authorities, the special documents for this partly completed machine.

Authorised representative for the compilation of the technical documentation

(EU address in the company)

Dipl.-Ing. Bernd Synowsky

Documentation representative

Partly completed machinery according to EC Directive 2006/42/EC is only intended to be installed in, or combined with, other machinery (or other partly completed machinery/systems) in order to form a completed machine pursuant to the Directive. This product must therefore only be put into operation when it has been determined that the complete machine/system in which it has been installed complies with the provisions of the above-mentioned directives.

Düsseldorf 23/05/2013

Stephan Kleine

Managing Director

Signature